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INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification <sup>6</sup> : <b>G06K 11/18, G06F 1/16, 3/02</b>		A1	(11) International Publication Number: <b>WO 98/43202</b>
			(43) International Publication Date: 1 October 1998 (01.10.98)
(21) International Application Number: PCT/US98/02417 (22) International Filing Date: 11 February 1998 (11.02.98) (30) Priority Data: 08/826,349      25 March 1997 (25.03.97)      US (71) Applicant: GATEWAY 2000, INC. [US/US]; 610 Gateway Drive, P.O. Box 2000, North Sioux City, SD 57049-2000 (US). (72) Inventors: GRIENCEWIC, Richard, W.; 7 Spruce Avenue, McCook Lake, SD 57049 (US). BURNETT, Robert, J.; 687 West Sawgrass Trail, Dakota Dunes, SD 57049 (US). MANSER, Brian, E.; 48 Sunset Drive, North Sioux City, SD 57049 (US). GLOVER, Jason, R.; 3127 Jones Street, Sioux City, IA 51104 (US). (74) Agent: VIKSNINS, Ann, S.; Schwegman, Lundberg, Woessner & Kluth, P.O. Box 2938, Minneapolis, MN 55402 (US).			(81) Designated States: AU, CA, JP, European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).  Published With international search report.
(54) Title: BUTTON WHEEL POINTING DEVICE FOR NOTEBOOK PCS (57) Abstract <p>An electronic input device for transmitting signals to a computer, the computer having a screen for displaying information thereon and a cursor indicating where on the screen the next transmitted information will be effected. The input device provides a pointing function, a click button function, and a scrolling and zoom function. The pointing function is provided by a pointing device such as a touch pad or trackball built into a data entry surface of the input device. The click button function is provided by one or more click buttons disposed on a front end of the input device adjacent the data entry surface. The scrolling and zoom functions are provided by a wheel, roller bar, or buttons disposed adjacent to the pointing device. The pointing device, click buttons, and scrolling/zooming device are operable by a user's thumb or finger such that the user may perform any combination of the functions simultaneously, quickly, comfortably and with a minimum of effort and hand movement.</p>			

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## BUTTON WHEEL POINTING DEVICE FOR NOTEBOOK PCS

5 Field of the Invention

The present invention relates generally to notebook computers, and more particularly to integrating a pointing device in a notebook computer.

## Background of the Invention

When windows-type operating environments were introduced to the  
10 computing public, the command strings or keystroke combinations required to  
effect many of the available display manipulations, such as scrolling and  
zooming, were either inefficient, inconvenient, or both. With expanding  
computer power and more sophisticated software, documents and other types of  
files increased in size and complexity. As a result the conventional methods of  
15 moving through and displaying documents became unacceptably tedious. New  
features have been continually developed to address these limitations.

In a conventional windows-type environment, such as Microsoft's Windows 95®, a user has the ability to control on-screen functions with either keystrokes or through manipulating on-screen icons with a pointing device such as a mouse. In conventional desktop systems a mouse is a separate device, independent from the keyboard or other devices. A mouse is primarily designed to enable a user to manipulate the cursor and on-screen images without having to resort to keyboard input. As such a variety of buttons or other interactive means have been designed into the various surfaces of a mouse. In a windows-type environment the user typically has the ability to use a mouse to manipulate various icons displayed by the computer on the screen and thereby control display aspects such as the position and scale of the presentation, and rate and direction of scrolling.

Conventional pointing devices have been generally limited to interacting  
30 with the computer through positioning the cursor (“pointing”) and then using the  
click buttons to initiate some action (“clicking”). A traditional mouse has a right  
and left click button, while some specialized pointing devices have incorporated  
three buttons. More recently a wheel-type feature has been added to the button

array on a mouse. One example is Microsoft's® IntelliMouse™, and another is EasyScroll® by Genius®. The IntelliMouse incorporates a wheel between the left and right click buttons, while EasyScroll places a roller between the buttons and additional control buttons on one side of the mouse. These wheel-type  
5 features enable the user to scroll through documents and perform other display control functions by manipulating the wheel, rather than moving the mouse to manipulate on-screen icons.

To use a mouse a user must move their hand from the keyboard. This can be inefficient and disruptive to the user's work flow. In an attempt to  
10 consolidate and minimize the amount of required keystrokes and hand motions, basic pointer control and click button operations have been incorporated into conventional keyboards and notebook computer chassis. Currently, on portable computers, functions affecting display characteristics such as zooming and scrolling are only accessible through on-screen menu and icon manipulation, or  
15 through sequences of key strokes. These conventional methods, however, are lacking in the level of precision control of the display characteristics. There remains a need to provide in portable computers an easy way to perform scrolling and other display control functions in a different manner than currently provided. This is a considerable challenge, however, due to constraints on  
20 available space. A device providing such functionality must be incorporated in the portable computer chassis such that current functionality is not compromised and also in such a way that the user is not required to learn new hand motions or otherwise disrupt their patterns of use to perform display control functions.

#### Summary of the Invention

25 A device configuration enabling a user to more efficiently perform on-screen operations such as zooming and scrolling is incorporated in a notebook computer. The configuration can also be incorporated into whatever type of pointing device is integrated into the notebook computer, such as a touch pad, stickpoint, or trackball. The present invention is an improvement over existing  
30 devices in that it takes into account the limited amount of physical space available for a scroll/zoom device on a laptop computer. In addition, the present

invention takes into consideration those aspects of the manner of using a notebook computer, such as hand and finger location, which are unique to that species of computer.

- According to one embodiment of the present invention, the scroll/zoom  
5 function is controlled by a device small enough to be incorporated into a pointing device which is in turn integrated into a notebook PC. A user's efficiency improves as hand motions are minimized and kept as natural as possible. Enabling all user interactions to be performed in one unit minimizes the required work space and makes user interaction more efficient. One advantage of the  
10 present invention is that the user gains a more precise control of display characteristics without sacrificing any of the benefits associated with consolidating user interactions with the computer. In one implementation the pointing device comprises a cursor control device (such as a touch pad), click buttons, and one or more button wheels. Other embodiments use as the cursor  
15 control device a stick point or trackball in the place of the touch pad. The one or more button wheels are situated such that the user can comfortably operate the button wheels from the same hand position they normally use to operate other functions of the pointing device. The click buttons function as typical mouse click buttons and are also positioned in an ergonomically satisfactory location.  
20 In a second implementation a roller bar is used in place of the one or more button wheels. The roller bar is located below the cursor control device such that the user can comfortably operate the roller bar with the thumb of either hand. In yet another implementation the device comprises two buttons. In one embodiment the buttons are arranged between the click buttons and cursor  
25 control device to provide natural, intuitive interaction with the buttons.

According to another embodiment the pointing device is a trackball with a frame. In this embodiment two of the frame members serve as click buttons and two other frame members provide control of certain on-screen display functions such as scrolling.

- 30 In another embodiment of the present invention, one of the described pointing devices comprising a cursor control device, a wheel device and click

buttons is incorporated into a conventional computer keyboard. The wheel device and click buttons are positioned relative to the cursor control device such that they are operable by the user's thumb while the user's hand is comfortably positioned over the cursor control device.

5           In another embodiment of the invention, the cursor control device, a wheel device and click buttons are incorporated into a portable laptop or notebook computer. The cursor control device, button wheel and click buttons are positioned on the portable computer keyboard such that a user operates the click buttons and button wheel with their thumb while their hand is in position  
10 over the cursor control device. Again, it is preferred that two such click buttons are positioned adjacent one another on the front center surface of the portable computer's keyboard for performing the same functions as conventional left and right mouse click buttons.

          According to another aspect of the present invention, the cursor control  
15 device, wheel device and click buttons are easily manipulated by one hand of the user.

          According to a further aspect of the present invention, the cursor control device, wheel device and click button are operable by the user without it being necessary for the user to move their hand away from the normal operating  
20 position for the particular input device.

          According to still another aspect of the present invention, any combination of the cursor control device, the wheel device and the click buttons are manipulated simultaneously and efficiently since the user need only manipulate each one of the cursor control device, wheel device and click buttons  
25 with one finger or a thumb.

          According to a further aspect of the present invention, the cursor control device, wheel device and click buttons are incorporated in a stationary remote control input device for operating a computer having a display screen with a cursor. In one implementation signals are transmitted between the remote  
30 control device and computer through a hardwired connection, while in another

implementation signals are transmitted via wireless electromagnetic circuitry incorporated in the remote control device and the computer.

### **Brief Description of the Drawings**

Figure 1 is a perspective view of a notebook computer constructed in accordance with one embodiment of the present invention.

Figure 2 is a schematic drawing of a standalone pointing device constructed according to one embodiment of the present invention.

Figure 3 is a schematic drawing of a computer keyboard constructed according to one embodiment of the present invention.

Figure 4 is a perspective view of a portion of a notebook computer constructed in accordance with one embodiment of the present invention.

Figure 5 is a schematic representation of another embodiment of the pointing device shown in Figure 1.

Figure 6 is a schematic representation of another embodiment of the pointing device shown in Figure 1.

Figure 7 is a schematic representation of another embodiment of the pointing device shown in Figure 1.

Figure 8 is a schematic representation of another embodiment of the pointing device shown in Figure 1.

### **Detailed Description of the Embodiments**

In the following detailed description of the embodiments, reference is made to the accompanying drawings which form a part hereof, and in which are shown by way of illustration specific embodiments in which the invention may be practiced. It is to be understood that other embodiments may be utilized and structural changes may be made without departing from the scope of the present invention.

Referring first to Figure 1, a portable computer 10 (also referred to as a notebook or laptop computer) constructed according to one embodiment of the present invention is shown in perspective view. The majority of the operational elements of computer 10 are contained in computer chassis 12, which has a plurality of sides. User interface mechanisms such as keyboard 15 and pointing

device 100 are incorporated in computer chassis 12 in such a way as to provide efficient user interaction with the computer and to minimize the overall size of the computer. Images and information are displayed on screen 17. A majority of users operate pointing devices with the thumb or index finger of one or the other hand. In the embodiment shown, pointing device 100 is located at the top center front of computer chassis 12, so that it is conveniently operable by natural movements of either hand of the user. The electronics of keyboard 15 and pointing device 100 are of conventional design, as are those associated with click buttons 115, 116 and button wheel 117.

10 In the embodiment shown in Figure 1, pointing device 100 comprises touch pad 110, button wheel 117 and click buttons 115, 116. Touch pad 110 is of a conventional design known to those skilled in the art and is capable of determining both the location of an object touching the surface as well as the velocity and direction of the object's motion along the surface. Touch pad 110 is  
15 designed and intended to sense the position and movement of an object such as a user's finger along its surface and to transmit this data to conventional electronic circuitry which in turn translates the data and thereby positions and controls the cursor on the computer screen. Touch pad 110 operates similar to a conventional mouse, in that movement of a mouse along a flat surface translates into similar  
20 movement of the cursor on the computer screen.

According to the embodiment of pointing device 100 shown in Figure 1, click buttons 115 and 116 are positioned adjacent the lower edge of touch pad 110. Click buttons 115 and 116 operate in essentially the same manner as the left and right mouse buttons of a conventional mouse. Depending upon the  
25 setting of the computer program, left click button 115 operates in the standard manner of a left mouse click button to signal the choice of a computer command associated with the cursor position on the display screen. Right click button 116 operates in the same manner as a right mouse click button and may, for example, be used to pull down special menus or cancel a particular aspect of a program,  
30 again depending upon the program and the options set by the user.



Button wheel 117 is mounted between and parallel to click buttons 115 and 116 and transversely between touch pad 110 and the front edge of the top surface 101 of computer chassis 12. Positioning the button wheel between the click buttons enables a user to effectively use the button without having to learn new keystrokes or modify their established hand patterns. The wheel operates to allow the user to perform such activities as scrolling up and down through the active window or zooming a portion of a display in or out, according to the controlling program and any user-defined options. For example, if the user has selected with the cursor a portion of the display image, rolling button wheel 117 forward transmits a signal to the central processing unit (CPU) of the computer where it is processed in a well-known manner to zoom in the selected area. In the same manner, if a previously zoomed area is selected the user is able to zoom it out by rolling button wheel 117 downward. Alternatively, if no zoom area is selected and button wheel 117 is activated, the contents of the currently active window are scrolled up or down, consistent with the direction button wheel 117 is rolled.

A system controller program running on computer 10 supervises software drivers which are programmed to distinguish between signals generated by cursor control device 110, click buttons 115, 116 and button wheel 117. Signals received from the various devices are processed by the operating system, which in turn interacts with the active application program(s) to determine which program the signals affect and what effect they have. Drivers associated with the various cursor control devices 110 and click buttons 115, 116 are well-known. The responses to signals generated by button wheel 117 may vary, depending upon the program which is receiving the signals.

In the embodiment shown, click buttons 115 and 116 and button wheel 117 are positioned relative to touch pad 110 so that they are operable by a user's thumb when the user's hand is positioned over the touch pad for normal operation. Click buttons 115, 116 and button wheel 117 are operable by the user to affect the operation of the portable computer relative to the position of the cursor on the display screen. For example, rolling button wheel 117 toward

touch pad 110 causes the active window to scroll up, while rolling button wheel 117 away causes the contents of the active window to scroll down. When button wheel 117 is centered between click buttons 115, 116 the user is able to use their thumb or index finger to smoothly scroll through screens and zoom in and out their data without having to hunt for scrollbars, buttons or menus on the screen. As a cursor control device such as a touch pad, stickpoint or trackball is most commonly used by applying an index finger, when this embodiment is implemented the user is not required to learn a "new" motion in order to effectively use button wheel 117. When the user moves their finger from touch pad 110 (or whatever cursor control device is implemented) to button wheel 117 it is one fluid motion that requires virtually no additional hand movement. The user is also able to leave their finger on touch pad 110 and manipulate button wheel 117 with their thumb with little wasted motion.

It is to be recognized that the examples given are illustrative only and not intended to be limiting in any fashion. Those skilled in the art will recognize that other cursor control devices (for example but not limited to trackballs or stickpoints) may be used in place of the touch pad 110. Other configurations, such as those varying the location of wheel 117 relative to cursor control device 110 or positioning pointing device 100 in a computer or peripheral device, are possible without exceeding the scope and spirit of the present invention.

In alternate embodiments, pointing device 100 is incorporated in a device peripheral to the computer. In one embodiment signals are transmitted between device 200 and computer 10 via conventional wiring 210. In another embodiment computer 10 and device 200 each comprise circuitry supporting wireless electromagnetic communications (such as infrared (IR) or radio frequency) enabling device 200 to operate as a remote pointing device. For example, as shown in Figure 2, pointing device 100 is incorporated in standalone device 200, which is communicably connected to the computer. In the embodiment shown in Figure 2, device 200 is stationary. The user moves the cursor on the screen by manipulating pointing device 100 with a finger or thumb while device 200 remains motionless. Thus pointing device 100 is easily

configured as either a standalone device or incorporated in a keyboard or computer chassis. The stationary device is more efficient than conventional devices. A user causes the cursor to move with a conventional device by physically moving the entire device across a surface.

5           In another embodiment, shown in Figure 3, pointing device 100 is incorporated in conventional computer keyboard 30. In the embodiment shown in Figure 3, keyboard 30 comprises pointing device 100 in the location traditionally reserved for a numeric keypad, in addition to a conventional QWERTY keyboard 35, and control and navigation buttons 37, 39 as found on  
10 conventional computer keyboards.

Figure 4 is a perspective drawing of a portion of portable computer chassis 12 showing another embodiment of the present invention. The computer shown comprises chassis 12, with keyboard 15 integrated in the top of chassis 12 and option bays 410 and 430 integrated in the front of chassis 12. Touch pad  
15 110 and click buttons 115 and 116 are also integrated in the top of chassis 12, conveniently positioned at the front and center. In the embodiment shown, button wheel 117 is incorporated in the front of chassis 12, between power bay 410 and module bay 430. A user typing on keyboard 15 or using pointing device 110 will normally position their hands such that their thumbs are located near or  
20 directly above button wheel 117. As a result, the position of button wheel 117 is such that it is easily operated by the thumb of either hand, and the user does not have to move their hands or search for button wheel 117 when they wish to activate its functions. Those skilled in the art will recognize that other configurations incorporating a button wheel on the front of computer chassis 12  
25 are possible without exceeding the spirit and scope of the present invention.

Alternate embodiments, shown in Figures 5 and 6, comprise a variety of feature combinations for configuring pointing device 100. In the embodiment illustrated by Figure 5, pointing device 100 comprises two button wheels 517, 518 positioned on either side of stick point 510. In the embodiment shown, a  
30 button wheel is positioned on either side of the pointing device, with each button wheel mounted upright and adjacent and parallel to the pointing device. Those

skilled in the art will, however, recognize that alternate placements are possible without exceeding the scope or spirit of the present invention. In one implementation of this configuration button wheels 517 and 518 perform identical functions, being placed on either side of stick point 510 to enable  
5 convenient, comfortable use of the stick point and button wheels by both left- and right-handed users. In an alternate implementation one of button wheels 517 or 518 provides scrolling functions and the other provides zoom functions. In yet another embodiment functions are associated with each button by the software operating in the current active window.

10 The embodiment shown in Figure 6 incorporates two scroll buttons 601, 602 in place of button wheel 117. Upper button 601, when depressed, provides functions such as scroll up and zoom in. Lower button 602, when depressed, provides concomitant functions such as scroll down and zoom out. Functions are associated with each button in a logical fashion such that the user is able to  
15 intuitively select the proper button for the desired function with minimal training.

In a further embodiment, illustrated in Figure 7, a roller bar is employed instead of a button wheel. Click buttons 115, 116 are located adjacent and directly below touch pad 110. Roller bar 701 is centered directly below click  
20 buttons 115, 116 so that the user is able to operate roller bar 701 with either thumb without having to move their hand from touch pad 110. Roller bar 701 operates in a similar fashion to button wheel 117. According to a further embodiment the user is able to switch between modes (such as scroll mode and zoom mode) by pressing down firmly on roller bar 701.

25 In another embodiment of pointing device 100, a trackball is used as the cursor control device. A trackball is a stationary device in which a rotatable ball is partially disposed within a cavity of the device. A user of the device can spin the ball within the cavity. The trackball detects the direction, and typically the speed, the user is spinning the ball, and conveys this information to the  
30 computer's central processing unit (CPU). The CPU then moves the cursor on the screen in the corresponding direction, with the corresponding speed. The

trackball typically allows for clicking via one or more separate selection buttons located on or near the device. In the embodiment of the present invention illustrated by Figure 8, a trackball pointing device 800 comprises rotatable ball 810 and selection buttons 801, 802, 815, 816. Selection buttons 815 and 816 correspond to right and left click buttons such as those incorporated in a conventional mouse. Selection buttons 801 and 802 provide scroll/zoom functions. As an example, the user depresses button 801 to scroll up through the active window or zoom in a particular area of the screen, depending upon where the cursor is located on the display. Likewise, when button 802 is depressed the displayed information scrolls down through the active window or zooms out a previously zoomed in area of the screen. Locating selection buttons 801, 802, 815, 816 adjacent to trackball 810 minimizes the user's hand movement and enables the user to work more efficiently. In addition, locating scroll/zoom buttons 801 and 802 respectively above and below trackball 810 places the functions in a logical position, reducing the need for the user to disrupt their train of thought and hunt for the desired activation means when they need to alter display characteristics of something on the display.

It is to be understood that the above description is intended to be illustrative, and not restrictive. Many other embodiments will be apparent to those of skill in the art upon reviewing the above description. The scope of the invention should, therefore, be determined with reference to the appended claims, along with the full scope of equivalents to which such claims are entitled.

## WHAT IS CLAIMED IS:

1. An electronic input device for transmitting signals to a computer having a screen for displaying information thereon and a keyboard for interacting  
5 with the computer, said input device comprising:
  - a stationary pointing device for controlling the movement of a cursor on the computer screen, the pointing device having a lower front edge;
  - one or more click buttons associated with the pointing device; and
  - 10 a first button wheel associated with the pointing device, the first button wheel for controlling display characteristics of information displayed on the computer screen.
2. The electronic input device of claim 1, wherein the pointing device is a  
15 touch pad, a stick point, or a trackball.
3. The electronic input device of claim 1, wherein the electronic input device is incorporated in the keyboard.
- 20 4. The electronic input device of claim 1, wherein the first button wheel is positioned adjacent the one or more click buttons and adjacent to the pointing device.
5. The electronic input device of claim 1, further comprising a second  
25 button wheel associated with the pointing device, wherein the first button wheel is positioned adjacent to a first side of the pointing device, and wherein the second button wheel is positioned adjacent to a second side of the pointing device.

6. The electronic input device of claim 1, wherein the device is integrated in a notebook computer, the notebook computer having a data input surface incorporating the keyboard and a front surface.
- 5 7. The electronic input device of claim 6, wherein the first button wheel is located on the data input surface of the notebook computer.
8. The electronic input device of claim 6, wherein the first button wheel is located on the front surface of the notebook computer.
- 10 9. The electronic input device of claim 1, wherein the device is connected to the computer via wire.
10. The electronic input device of claim 1, wherein the device is  
15 physically independent from the computer and incorporates electromagnetic frequency generating circuitry for communicating with the computer.
11. A notebook computer, having a keyboard, a data input surface, a front surface and a screen for displaying information thereon, wherein said keyboard  
20 comprises:  
an integrated pointing device;  
left and right click buttons associated with said pointing device; and  
a display control device, said display control device comprising means for controlling display characteristics of information displayed on said computer  
25 screen.
12. The notebook computer of claim 11, wherein the display control device comprises a wheel mounted transverse to the surface of the notebook computer keyboard, wherein the wheel is adjacent the pointing device and  
30 between the left and right click buttons.

13. The notebook computer of claim 11, wherein the display control device comprises:

a first wheel mounted transverse to the surface of the notebook computer keyboard such that it is adjacent a first side of the pointing device; and

a second wheel mounted transverse to the surface of the notebook computer keyboard such that it is adjacent a second side of the pointing device.

14. The notebook computer of claim 11, wherein the display control device comprises a first wheel disposed on the front surface of the notebook computer, wherein the first wheel is operable by a user's thumb rotating or depressing the first wheel when the user's hands are naturally in position over the pointing device to affect the operation of the notebook computer based on the position of the cursor on the screen.

15. The notebook computer of claim 11, wherein the display control device comprises a first button and a second button mounted between the left and right click buttons.

16. The notebook computer of claim 11, wherein the display control device comprises a roller bar located directly below and parallel to the line described by the click buttons.

17. The notebook computer of claim 11, wherein the integrated pointing device comprises a touch pad.

18. The notebook computer of claim 11, wherein the integrated pointing device comprises a trackball having an integrated frame, wherein a first frame member serves as the left click button and a second frame member serves as the right click button, and wherein the display control device comprises:



a first scroll button integrated in a third frame member; and  
a second scroll button integrated in a fourth frame member.

19. An electronic input device for transmitting signals to a computer  
5 having a screen for displaying information thereon and a keyboard for interacting  
with the computer, the signals for controlling the information display, said input  
device comprising:

a stationary pointing device for controlling the movement of a  
cursor on the computer screen, the pointing device having a lower  
10 front edge;  
one or more click buttons associated with the pointing device; and  
a first button wheel associated with the pointing device, the first  
button wheel for controlling display characteristics of information  
displayed on the computer screen, wherein the first button wheel is  
15 positioned adjacent the one or more click buttons.

20. The electronic input device of claim 19, wherein the electronic input  
device is incorporated in the keyboard.

20 21. The electronic input device of claim 19, wherein the pointing device is  
a touch pad, a stick point, or a trackball.

22. The electronic input device of claim 19, wherein the device is  
integrated in a notebook computer, the notebook computer having a data input  
25 surface incorporating the keyboard.

23. An electronic input device for transmitting signals to a computer, the  
computer having a screen for displaying information thereon, a keyboard  
integrated in a data input surface for interacting with the computer, and a front  
30 surface, the input device comprising:

a pointing device integrated in the data input surface, the input device for controlling the movement of a cursor on the computer screen, the pointing device having a lower front edge;

one or more click buttons associated with the pointing device, the click  
5 buttons positioned on the data input surface and adjacent the pointing device;  
and

a button wheel associated with the pointing device and located on the front surface of the notebook computer, the button wheel for controlling display characteristics of information displayed on the computer screen.

10

24. The electronic input device of claim 23, wherein the pointing device is a touch pad.

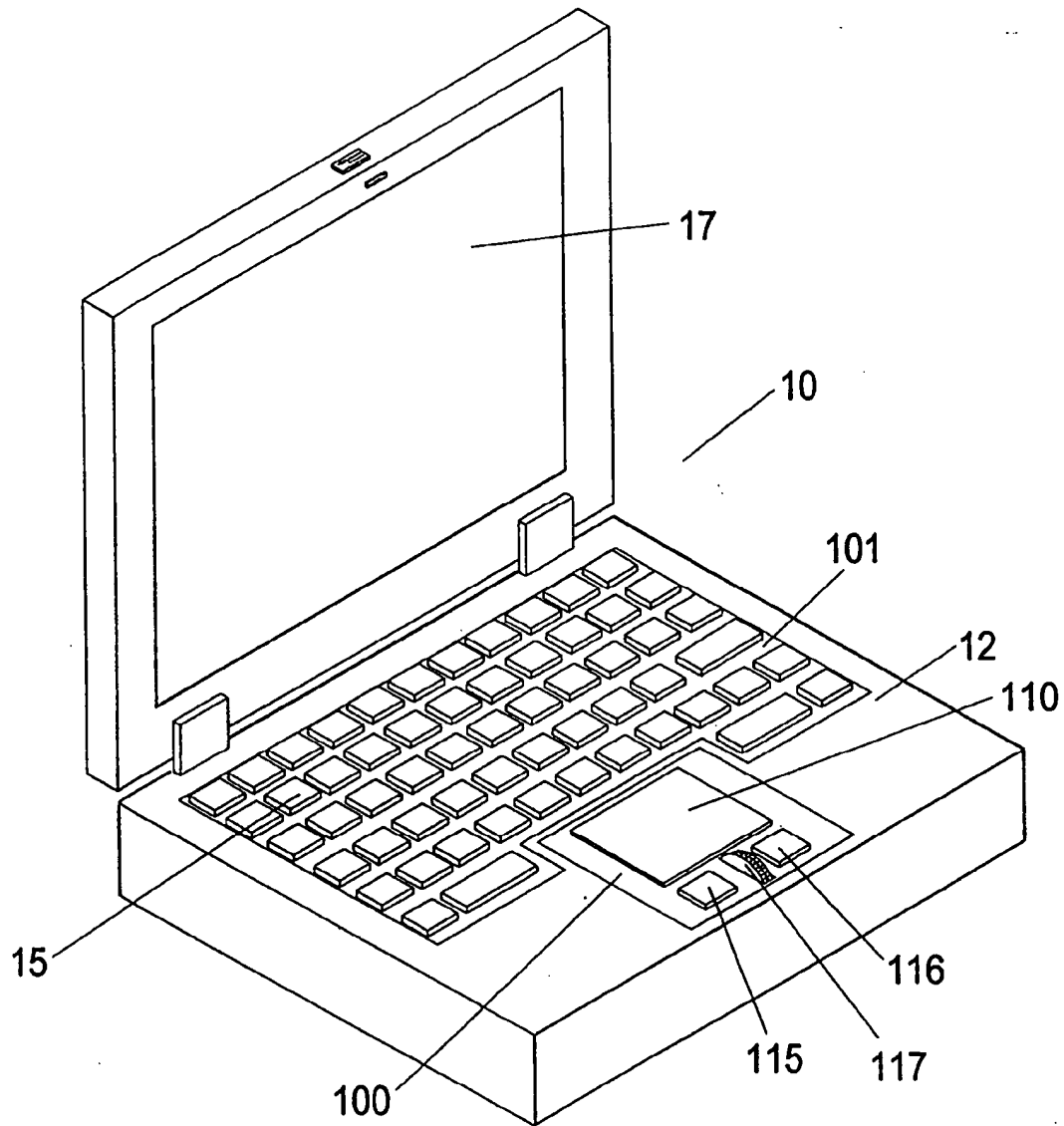


FIG. 1

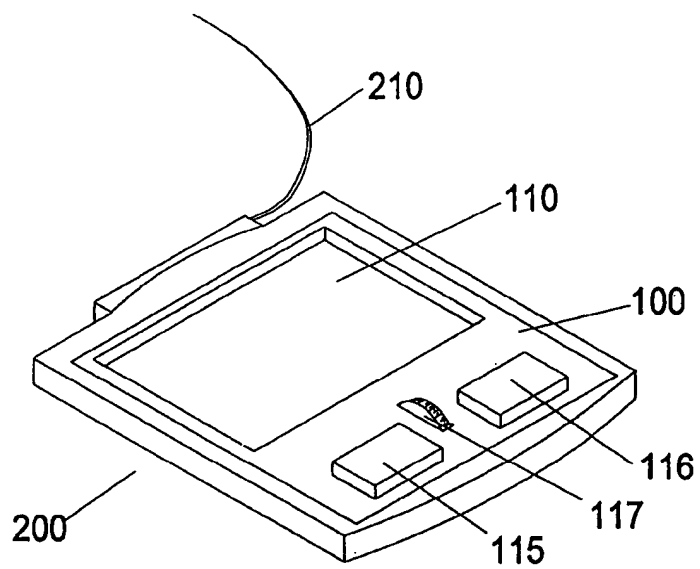


FIG. 2

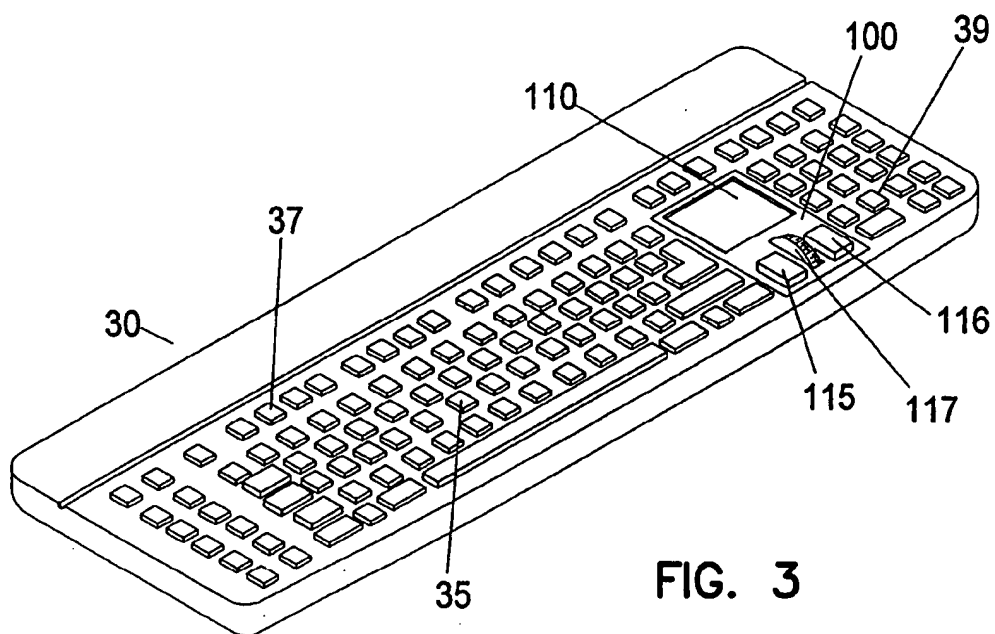
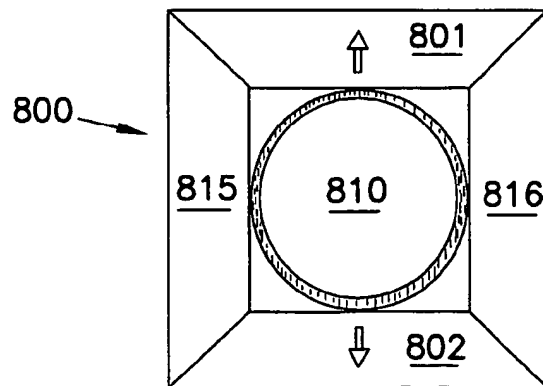
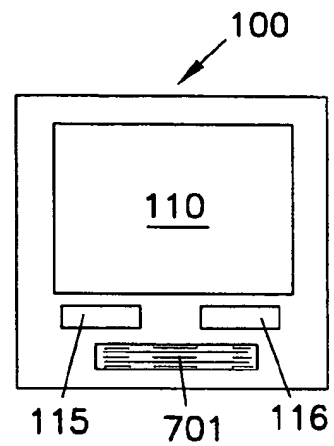
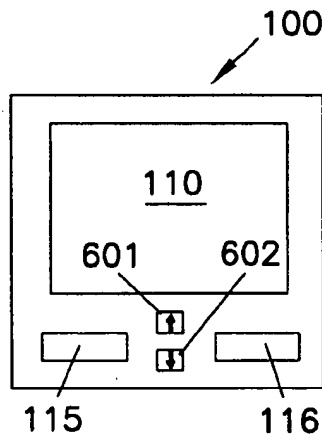
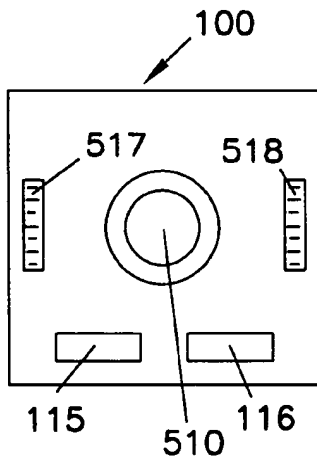
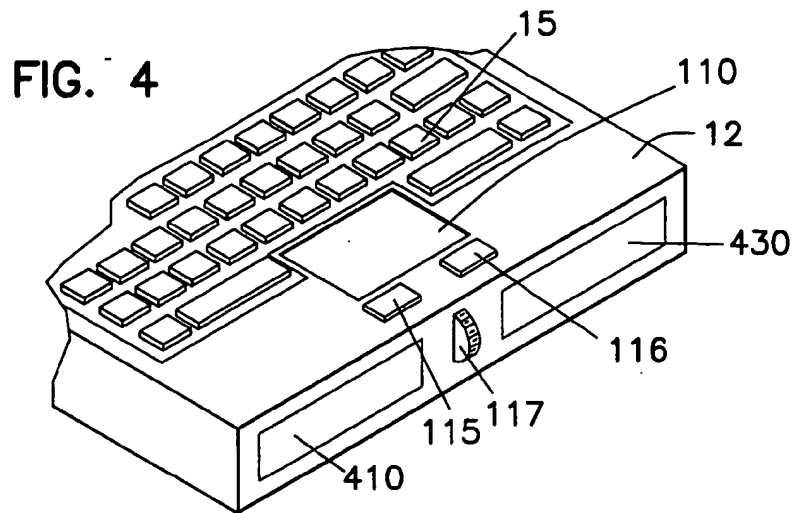


FIG. 3



# INTERNATIONAL SEARCH REPORT

International Application No  
PCT/US 98/02417

<b>A. CLASSIFICATION OF SUBJECT MATTER</b> IPC 6 G06K11/18 G06F1/16 G06F3/02		
According to International Patent Classification (IPC) or to both national classification and IPC		
<b>B. FIELDS SEARCHED</b> Minimum documentation searched (classification system followed by classification symbols) IPC 6 G06K G06F		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
Electronic data base consulted during the international search (name of data base and, where practical, search terms used)		
<b>C. DOCUMENTS CONSIDERED TO BE RELEVANT</b>		
Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 662 669 A (MICROSOFT CORP) 12 July 1995 see column 2, line 42 - column 3, line 1 see column 10, line 19 - line 47 see column 11, line 11 - column 12, line 22 see column 12, line 56 - column 13, line 3; figures 8,9	1,2,4,5, 19,23
Y	---	3,6,7, 9-14, 16-18, 20-22,24
	-/--	
<input checked="" type="checkbox"/> Further documents are listed in the continuation of box C. <input checked="" type="checkbox"/> Patent family members are listed in annex.		
<b>Special categories of cited documents:</b> "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier document but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art. "S" document member of the same patent family		
Date of the actual completion of the international search  5 June 1998		Date of mailing of the international search report  19/06/1998
Name and mailing address of the ISA European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2940. Tx. 31 651 epo nl Fax: (+31-70) 340-3016		Authorized officer  Bailas, A

# INTERNATIONAL SEARCH REPORT

International Application No  
PCT/US 98/02417

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	"DEPTH/FORCE CAPABILITY FOR MOUSE POINTING DEVICES" RESEARCH DISCLOSURE, no. 342, 1 October 1992, page 769 XP000326673 see abstract	1,2
Y	---	16
Y	WO 95 24174 A (MEROCEL CORP) 14 September 1995  see page 7, paragraph 2 - page 8, paragraph 2; figures 1H,1I,2	6,7, 11-14, 16-18, 20-22
Y	"DEPTH/FORCE CAPABILITY FOR POINTING STICK DEVICES" RESEARCH DISCLOSURE, no. 342, 1 October 1992, page 769 XP000326674 see the whole document	3,20
Y	"SAMSUNG PORTABLE" PC MAGAZINE., vol. 15, no. 14, August 1996, NEW YORK US, page 269 XP002067199 see the whole document	9,10,17, 24
Y	US 5 305 238 A (STARR III HENRY W ET AL) 19 April 1994 see column 11, line 32 - line 60	18
A	PATENT ABSTRACTS OF JAPAN vol. 012, no. 396 (P-774), 21 October 1988 & JP 63 136221 A (ALPS ELECTRIC CO LTD), 8 June 1988, see abstract	7
A	WO 93 18500 A (GRANT ALAN H) 16 September 1993 see page 23, line 3 - line 23; figure 14	8
A	GB 2 299 394 A (FRAZER CONCEPTS LTD) 2 October 1996 see page 5, line 1 - line 13	9,10,17, 24

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Information on patent family members

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